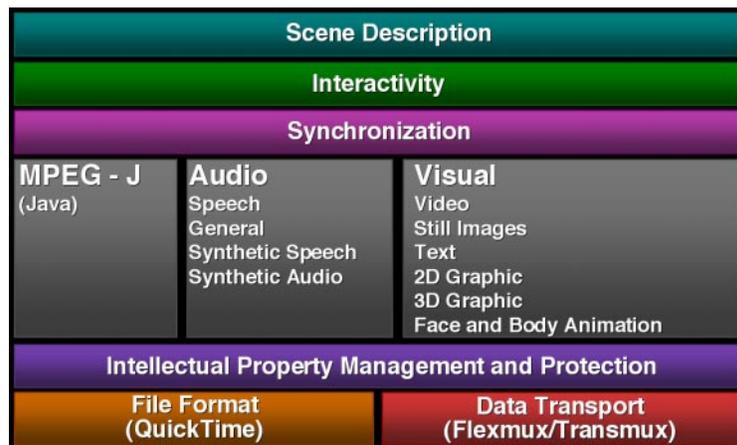# MPEG-4

The new standard for multimedia on the Internet,
powered by QuickTime.

MPEG-4 is the new worldwide standard for interactive multimedia creation, delivery,
and playback for the Internet. What MPEG-1 and its delivery of full-motion, full-screen
video meant to the CD-ROM industry and MPEG-2 meant to the development of DVD,
MPEG-4 will mean to the Internet.

What Is MPEG-4?

MPEG-4 is an extensive set of key enabling technology specifications with audio and
video at its core. It was defined by the MPEG (Moving Picture Experts Group) com-
mittee, the working group within the International Organization for Standardization
(ISO) that specified the widely adopted, Emmy Award–winning standards known as
MPEG-1 and MPEG-2. MPEG-4 is the result of an international effort involving hundreds
of researchers and engineers. MPEG-4, whose formal designation is ISO/IEC 14496, was
finalized in October 1998 and became an international standard in early 1999.

The components of MPEG-4

Multimedia beyond the desktop
The MPEG committee designed MPEG-4 to be a single standard covering the entire digital media workflow—from capture, authoring, and editing to encoding, distribution, playback, and archiving.

The adoption of the MPEG-4 standard is not just critical for desktop computers, but is increasingly important as digital media expands into new areas such as set-top boxes, wireless devices, and game consoles. Member companies of the MPEG-4 Industry Forum (M4IF) such as Philips and Sony have released many of these devices.

For content providers, this means a simple, cost-effective "author once, play anywhere" model. MPEG-4 provides the farthest possible reach for their content since it eliminates the time-consuming and costly task of encoding and managing the same material in multiple formats. For consumers, this means that the choice of media players can be based on features instead of on the content available for a particular format.

Choosing a standard based on time-tested technology
MPEG-4 was created to ensure seamless delivery of high-quality audio and video over the Internet, IP-based networks, and a new generation of consumer digital media devices. Because these devices range from narrowband cell phones to broadband set-top boxes to broadcast televisions, MPEG-4 provides scalable, high-quality audio and video via an "author once, play everywhere" standard.

The ISO could have chosen to base its new standard on any existing file format, or it could have created an entirely new format. The ISO chose to use the QuickTime format because of its decade-long track record in the industry. Quite simply, QuickTime works. Designed from the ground up to be cross-platform and media agnostic while providing stability, extensibility, and scalability, QuickTime delivers the foundation needed to encode, process, and play digital media on any MPEG-4–compliant device. And since its inception in 1991, QuickTime has incorporated the best technology available to deliver the highest-possible quality. That track record of high-quality media delivery was an important factor in the decision of the MPEG committee to base MPEG-4 on the QuickTime file format.

A flexible container
The QuickTime file format is a "container" that can hold a variety of media types and their respective data, such as audio, video, Macromedia Flash animations, text, images, and VR. QuickTime packages these media types as "tracks," which are a key component of what has made QuickTime so adaptable. New capabilities can be added simply by creating new track types. What's more, new versions of QuickTime maintain backward compatibility, ensuring the continued viability of multimedia developed with earlier versions.

Meta Data	Video
	Audio
User Data Copyright Information	VR
	3D
Media Data	MIDI
Media Index	Graphics
Types of Tracks Compression Format Edit Information	Text
	and many more…

The QuickTime file format

As the file format for MPEG-4, QuickTime has become the cornerstone of the emerging industry standard for streaming high-quality media to the desktop and beyond.

Massive Distribution Means Huge Momentum

The integration of QuickTime into all aspects of the digital media workflow has jump-started the adoption of MPEG-4 in the marketplace.

QuickTime has gained broad consumer acceptance, with QuickTime 6 reaching 100 million Macintosh and Windows users in less than 10 months, resulting in the largest deployment of MPEG-4–compliant media players in the world.

Hundreds of digital cameras from popular manufacturers such as Minolta, Olympus, and Sanyo store media in the QuickTime format, enabling easy integration into the creative workflow for consumers and media professionals.

Hundreds of digital cameras support QuickTime.

The most powerful content creation software from industry leaders such as Adobe, Apple, Discreet, and Microsoft is built on the QuickTime architecture. With QuickTime providing MPEG-4 authoring capabilities, those products instantly become MPEG-4–compliant authoring products.

Over half a million copies of QuickTime Streaming Server and its open source version, Darwin Streaming Server, have been downloaded to date. And some of the largest server companies in the world, including Sun, IBM, and Real Networks, have added QuickTime streaming abilities to their servers. QuickTime Streaming Server is a fully compliant MPEG-4 streaming server that when paired with QuickTime provides an end-to-end, standards-based solution.

Momentum for MPEG-4 continues to grow. The 3rd Generation Partnership Project (3GPP) chose to base its new wireless multimedia standard on the solid foundation of MPEG-4. Motion JPEG 2000, Japanese Association of Radio Industries and Business, and Digital Radio Mondiale are other groups that have chosen to adopt and build on MPEG-4. In addition, many of the Internet's premiere content providers have adopted MPEG-4 for the delivery of their rich multimedia.

Why Do Standards Matter?

Quite simply, standards build confidence. And they build markets. Instead of a world fractioned into small competing technology fiefdoms, standards create the foundation for widespread adoption of new consumer technologies. Take a look around your living room. Any CD plays in any CD player; any television station can be viewed on any brand of television; any DVD plays in any DVD player. This confidence, ease of use, and rapid consumer acceptance of new media technologies are all possible because of standards.

NTSC	MPEG-2	RedBook	JPEG

MP3/AAC	AC-3	FM	DV

Consumer devices built on standards

Standards fuel innovation
Standards have paved the way for technologies never thought possible. Satellite television is based on a standard developed in 1994: MPEG-2. Standard file formats have made CD and MP3 players commonplace for the playback of music.

Standards provide economy
As standards are ratified, the industry can focus on how to deploy them at a lower cost instead of on developing redundant technologies. For example, the adoption of the MPEG-2 standard has lowered delivery costs and improved quality in DVD and digital satellite technologies.

Standards provide choice
Standards enable the builders of media networks to select products from a number of vendors and integrate them into a single, scalable system. Competition between vendors will result in a broader set of products to choose from, varying in cost, performance, and features.

The Apple Standard of Innovation

Apple has a long history of using standards to support the adoption of innovative technologies, and MPEG-4 is no exception. From USB and Bluetooth connections for peripherals, to AirPort (802.11) wireless networking, to FireWire (IEEE 1394) high-speed digital video transfer, Apple has championed technology standards that have been adopted throughout the industry. Continuing in this tradition, Apple has contributed the QuickTime file format as the foundation for MPEG-4 and has worked closely with the MPEG committee to define and ratify the standard.

MPEG-4 and ISMA

The Internet Streaming Media Alliance (ISMA) was formed to accelerate the adoption of open standards for streaming rich media—video, audio, and associated data—over the Internet. Formed in December 2000 by Apple and other leading technology companies, including Sun, IBM, Cisco, Kasenna, and Philips, ISMA covers the entire spectrum of streaming media technologies.

Standards for many of the fundamental pieces needed for streaming rich media over IP already exist. ISMA adopts parts or all of those existing standards and contributes to those still in development in order to complete, publish, and promote a systemic, end-to-end specification that enables cross-platform and multivendor interoperability.

The first specification from ISMA defines an implementation agreement for streaming MPEG-4 video and audio over IP networks. To promote interoperability, ISMA has defined profiles that specify parts of the MPEG-4 standard. ISMA Profile 0 specifies a standard for connections up to 64 Kbps. ISMA Profile 1 takes that to 1.5 Mbps. ISMA's ongoing work to augment the specifications will include adopting methods for digital rights management, reliable quality of service, and wireless delivery, as well as other relevant technologies. For more information about the Internet Streaming Media Alliance, visit www.isma.tv.

MPEG-4 and QuickTime 6

While MPEG-4 is an extensive set of key enabling technology specifications, audio and video are the elements at its core. Audio and video are therefore the focus of Apple's MPEG-4 implementation, in addition to MPEG-4 file format support. These elements are included in QuickTime 6.

Video
MPEG-4 specifies a modern, highly efficient video codec using the latest compression algorithm technologies that results in high-quality video whether at Internet or satellite data rates. It can handle a variety of frame sizes and frame rates. QuickTime 6 includes an Apple-developed standard implementation of the MPEG-4 video codec, featuring a versatile single-pass variable bit rate (VBR) encoder that can be set to a target data rate to ensure playback at the appropriate data rate for a particular delivery mechanism.
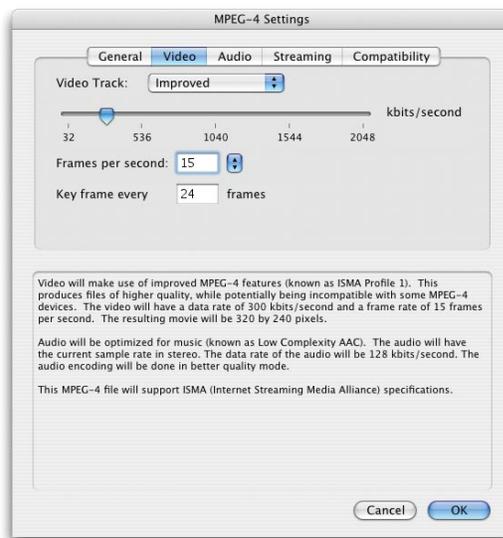
A new interface for adjusting MPEG-4 video settings

Audio

MPEG-4 audio facilitates a wide variety of applications that can range from speech to high-quality multichannel audio, and from natural to synthesized sounds. Specific audio support in QuickTime 6 includes the AAC (Advanced Audio Coding) codec, which provides almost twice the clarity of MP3 audio at the same bit rate with equal or smaller file sizes.
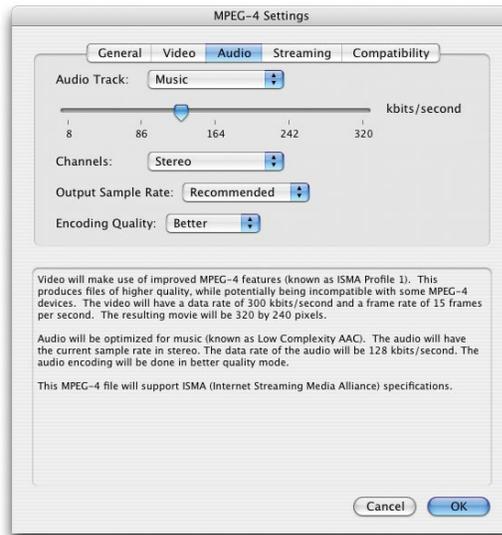
A new interface for adjusting MPEG-4 audio settings

QuickTime 6 and Digital Media

QuickTime 6 brings to the digital media industry a bright future—today. Content creators now have the opportunity to develop, produce, and deliver rich media to a huge worldwide audience more easily and less expensively, allowing them to refocus resources on the creation of content. Together with other ISMA members, Apple is working to ensure that content created with QuickTime will perform seamlessly with other MPEG-4 ISMA-compliant implementations. The result of all this is a long-awaited improvement in the digital media user experience.

For More Information

For more information about QuickTime and MPEG-4, visit www.apple.com/quicktime.